beetles

Science and Teaching for Field Instructors

Student Activity Guide

Walk & Talk

Many field instructors have found this simple routine to be transformative for their field experiences with students, because it kicks off discourse so well. It's easy to lead, and easy to participate in, because it's primarily one-on-one discussion. While walking from one spot to the next, students discuss prompts and questions in rotating pairs. It helps establish a learning community and a "culture of talk" for your group, in which ideas and observations are discussed and valued by all members. It's particularly useful at the beginning of a field experience as an invitation to the theme, and then provides a way to reflect back at the end of the experience.

Students will:

- **Discuss various topics and questions with peers.**
- **Improve listening skills**
- **Use scientific language to exchange ideas.**
- **Become more comfortable sharing ideas with the group.**

Grade Level:
Any grade

Timing:
Flexible timing: 5–20 minutes

Related Activities:
Walk & Talk can be used in the invitation or reflection stage of any activity.

Materials:
Prepared questions

Tips:
To ensure a successful experience, review the teaching tips found on page 2 and throughout this guide.

Setting:
Choose a path wide enough so partners can walk two abreast. It's great to do at the beginning and end of a hike.

NEXT GENERATION SCIENCE STANDARDS

***Walk & Talk* is a discussion routine that can be used throughout an activity or sequence of activities to support the type of learning called for by the *NGSS (and Common Core)* by providing students the opportunity to talk about science ideas, and creating a culture of discourse within a group of students. For additional information about connections to *NGSS*, go to page 9 of this guide.**

THE LAWRENCE HALL OF SCIENCE
UNIVERSITY OF CALIFORNIA, BERKELEY

Discussion Routine

Walk & Talk

ACTIVITY OVERVIEW

Walk and Talk	Learning Cycle Stages	Estimated Time
Introducing the Activity	Invitation	3 minutes
Discussing Questions	Invitation, Reflection	2–17 minutes
TOTAL		5–20 minutes

TEACHING TIPS

Field Card. On page 11 of this guide, you'll find a condensed, pocket-sized version of the lesson that you can carry in the field.

Read the Instructor Support Section. Beginning on page 7 , you'll find more information about pedagogy, student misconceptions, science background, and standards.

Ask Juicy Questions. When offered a "juicy" question, students will enthusiastically begin chattering away, and a single question can often sustain their interest for a while. Preplanned and well-tested questions have the advantage in leading to effective discussions because students consistently find them interesting to talk about. If a question works well, write it down and use it again with other students. These kinds of questions are **gold**, and the more you experiment with asking different questions, the more you'll be able to collect them for future discussions. If a question doesn't lead to an interesting discussion, try asking follow-up questions, change the phrasing, or just ditch the question altogether, and let it quietly decompose on the forest floor.

Make *Walk & Talk* an essential routine. You can use this activity whenever you're walking with students and want to offer them the opportunity for discussion. Give students questions at the beginning of a lesson that help them access their prior knowledge—or, in the middle of a lesson while switching to a new location, offer students a question that connects to the theme of the lesson, or gives them an opportunity to apply a concept they've just learned. It's a useful way of keeping students engaged in a topic throughout the day, and discussing science ideas between different activities.

All materials created by BEETLES™ at The Lawrence Hall of Science.
Find the latest activities and information at http://beetlesproject.org.

Introducing the Activity

1. **Form two equal lines with everyone on hike, including yourself & other adults in one of the lines.** Tell students to form two parallel lines standing next to each other so each person has a partner in the line across from them. Include *yourself* and any other adults in one line, so you'll also have a chance to talk to a few students, and to keep adults engaged with the experience.

2. **Make sure everyone knows who their partner is.** Make sure they look across at the other line and identify their partner, with a greeting/icebreaker fist bump, high five, elbow bump, thumb war, do-si-do, etc. If you have an odd number of students, you could remove one adult (but make sure that *you* remain in the line!) or make one group of three students at the back of the lines.

3. **Introduce how it works: discussing questions & the gentle "touch of silence."** Explain that you'll give students a question to talk about with the partner across from them. Each pair will discuss the question as they walk along the trail, until they feel the "touch of silence." The instructor starts the touch of silence by gently touching the shoulders of the first two students behind them. These two will then *gently* pass the touch down the line, until the entire group is quiet. Practice this once with your students, so they know what to do.

Discussing Questions

1. **State question twice, then say, "walk & talk!"** Once the group understands the directions, clearly say the first question twice (see example questions starting on page 5). Tell them to begin walking & talking down the trail.

2. **Use "touch of silence" to get attention & stop the lines.** Allow about 1–3 minutes for partners to discuss the first question. As their engagement in the conversation winds down, stop walking, tap the first two students at the front of each line and wait for the entire group to become silent.

3. **Everyone takes step back, & whole group shares interesting things their** *partners* **said (***but you don't need to do the whole-group share every time***).** Once they've stopped walking and talking, ask them to take a step backward to make it easier for everyone to see one another. Call on 2–3 students to share something *their partner said* about the question. Make sure they share loud enough for all to hear. You don't need to do this for every question (if you did, it would likely get tedious). Stopping to share out occasionally will help reveal student thinking about concepts relevant to what you're teaching, and allows them to learn from each other's comments.

4. **Your partner goes to other end of line & everyone in that line shifts one person down.** Tell students which of the lines will shift with each question (not the line you're in!). Tell the student at the beginning of that line to walk/dance/run/skip down between the lines, to the end of the same line. Tell this line to shift one position towards the front of the line so everyone

TEACHING NOTES

Informal assessment check-in. Participating in the activity yourself is an important opportunity to talk to students one-on-one, hear their ideas, and assess student understanding in a low-pressure way. Let your student partner do most of the talking, and be sure to ask them follow-up questions to try to understand their ideas and reasoning. During whole group sharing, you can assess understandings of other students, and of the group in general.

Writing out questions. Some instructors like to write out questions on signs, and hold up the sign as they're asking the question. This gives students more help understanding the discussion question, especially if it's at all complex. Seeing the words in writing can help English Language Learners, particularly with "cognate" words. It's said that cognates are often "seen but not heard," and a word like "discussion" in English is easier to recognize as similar to the Spanish spelling, *discussion*, than by only hearing it spoken.

Start with students sharing partner's ideas, later shift to sharing own ideas. It's important to begin with students sharing something their partner said, to encourage them to listen to each other. Over time, particularly as interesting whole group discussions begin, you can shift to students sharing their own thoughts.

Cheering for person who is switching. It's fun to have the rest of the group cheer for the person as they go to the other end of the line.

is facing a new partner.

5. **Repeat the process with a new question.** When students are ready, give them a new question to discuss, and continue along the trail. Each time you pause the group, always send the front person from the same line (your partner) to the back of the line, while students in the other line stay in the same position.

6. **Seek out interesting questions/points made, & ask what others think, to get whole group discussion rolling.** Keep an ear out for questions that seem particularly interesting to your group, as well as questions and points students make that seem interesting. When you find them, ask other students what they think about the question/point, to try to stimulate discussion.

7. **Vary the way you handle each partner switch.** It works well to vary the following after partners have talked:

   - a few share what their partner said, then switch partners (good for developing listening skills)
   - switch partners without whole group discussion (good to keep hike moving & avoid tedium)
   - a few share their own thoughts. See if you can get an interesting whole group discussion going (good for creating culture of on-going discussion of interesting ideas)

TEACHING NOTES

Ask broad questions. Make sure your questions are broad enough to ignite an exchange of ideas between students. Broad questions have more than one possible answer and encourage divergent thinking. Narrow questions, (also known as close-ended questions or focused) have only one correct answer and don't tend to evoke productive discussion.

Some time without *Walk & Talk*. Make sure students walking time isn't always structured, and that during extended field experiences they also have time to just walk, chat, look, and wonder.

Facilitate, don't dominate. During whole group share, be curious and accepting of all responses. You might occasionally restate what a student said to check to make sure that's what they meant (especially if the student spoke too softly for all to hear). Try to avoid answering the questions yourself, or commenting on every one. Instead, to prompt respectful discussion, you could *occasionally* ask others what they think of a particular statement.

Why students can spend more time with a question during *Walk & Talk*. One of the reasons *Walk & Talk* works well is that it's often more comfortable to talk with someone as you're walking along with them in the outdoors than it is when you're sitting or standing still looking at each other. If students run out of things to say when stationary, it can be awkward silence and crickets, but when you're walking along, it's pleasant to just be walking quietly in nature, and then to perhaps resume conversation when you or your partner think of something more to say.

Questions for Various Scenarios

During the introduction of an ecosystems hike:

- *Find as many ways you can that you and your partner are connected. Music? Activities? Interests? People you know?*
- *Who lives here? Look around. What organisms do you see? What organisms do you think live here that you're not seeing?*
- *Discuss as many ways as you can think of that organisms in this ecosystem might be connected with each other.*
- *Look at that (stump/tree). Discuss as many ways as you can think of that other organisms might use that stump/tree to survive.*
- *What do you think organisms would need in order to survive in this ecosystem?*
- *What organisms do you think we might find when we explore the creek/pond?*
- *How do you think the ground here might be different if there were no decomposers?*

For more advanced learners:

- *How do you think air cycles and changes in ecosystems like this one?*
- *In one year an 8 lb. rabbit may eat and drink ~ 400 lbs. of plants and water. About 140 lbs. comes out as poop and pee. But what happens to the other 260 lbs.? Hmmm…*

During the introduction of an adaptations hike:

- *Describe an adaptation of an organism.*
- *What are some structures and behaviors humans have that help us survive?*
- *What are different ways animals protect themselves?*
- *What are different ways plants protect themselves?*
- *What colors do you think might help animals in this area survive?*
- *What are different ways animals have of getting around?*
- *What do deer need to survive?*
- *What does that tree need to survive?*
- *If this habitat were to become much dryer, what behaviors or body structures might help some organisms survive better than others?*
- *What are some questions you have about adaptations?*
- *What are different ways plants have of reproducing?*

During a hike (more challenging):

- *Some banana slugs are bright yellow. Some are greenish-yellow with black spots. Do you think banana slug coloration is for camouflage or for warning?*
- *Describe, or ask a student to describe, a strange structure or behavior of an organism. How do you think that adaptation may have evolved over many generations?*

TEACHING NOTES

Quote."I love *Walk & Talk*! I use it all the time. It works great before and after activities. It's also a great way to keep kids engaged while hiking, especially when going up steep hills. I came up with a way for all students to partner with all other students–I am always in the front of line #1 and when it's switching time, the person behind me (in line #1) goes to the front of line #2 and is my new partner, and the person in the back of line #2 goes to the back of line #1… kind of like a rotating rectangle after every switch. Everybody except me moves each time. You can also do it where each adult chaperon also has a designated place in line where they stay while students rotate. That way adults will always be partnered with students."

— Lucy Clark, Field Instructor, Walker Creek Ranch

TEACHING NOTES

- *The oils from poison oak make some (not all) people itch. Deer eat it, and it doesn't make them itch. Do you think this oil is an adaptation to protect itself, or do you think it's not an adaptation, and the itching is just a coincidence?*
- *The Rough-Skinned Newt and the California Newt are slow and easy to catch, but they are so poisonous to eat that one could kill 20 people. Yet common Garter Snakes can eat these newts and survive. Why and how might newts have become so poisonous?*

At the end of a hike:

- *What were some interesting things about anything we experienced today?*
- *Talk about things you've enjoyed.*
- *Talk about things you've learned.*
- *What helped you to learn today?*
- *How might you describe what you did on this hike to someone else?*
- *What were some ideas that made you think in different ways?*
- *What are some questions you have about organisms or anything else we saw?*
- *Think quietly to yourself about things you did today that make you feel proud, as well as things you could do better.*
- *What are some skills, like asking good questions, that you got better at today?*
- *Did you notice anyone else doing something today that impressed you?*
- *What are some examples of how people treated each other well today?*
- *Describe some things you learned today that are not facts. Like different ways to look at or think about things...*
- *Pretend you're talking to a younger brother or sister. Describe to them how to make observations in nature.*
- *Where are places near your home where you could explore nature in this way?*
- *Replay some of the funniest moments of the day.*

Examples of Improvised Questions:

Improvised questions. Questions made up on the spot have the advantage of connecting the discussion to specific surroundings and experiences, and to ideas that students bring up themselves. A student may say something interesting in response to one question that inspires the next question for the group. A nearby organism noticed by the group may also inspire good questions.

Situation 1: Student points out a tree to the group that has caught her interest, and the other students are also impressed.

- *Discuss with your partner any interactions you think other organisms in this ecosystem might have with that tree.*

Situation 2: After you've found some bones on the trail and completed a round of *Nature Scene Investigators (NSI)*, students are excited about their explanations.

- *Discuss which explanations seem the most likely and include evidence to support your position.*

Instructor Support

Walk & Talk works great at the start of field experiences to put students into the mindset of discussing and thinking about topics relevant to the theme. It helps establish your group as a "learning community." When instructors partner with individual students and also listen thoughtfully to group responses, they can get a sense of students' prior knowledge. It's also a great way to use the time while the group is walking from campus or classroom to wherever you're headed. *Walk & Talk* works really well as a reflection activity towards the end of field experiences, especially when you're pressed for time returning from a hike.

Teaching Knowledge

Walk & Talk can be a useful device for moving kids up steep terrain, or anytime you need students to move along a wide trail. Pausing the group for each new question allows straggling students to catch up and catch their breath, and switching partners allows different students to be at the front of line. It also creates community by mixing up pairs. You can also do the activity standing in two lines, without walking anywhere.

Developing the spirit of inquiry & investigation. Beginning a field experience with students talking to each other about interesting questions sets a tone of inquiry, exploration, and exchange of ideas. Students are invited into the experience by thinking about what they know and how it may apply to the activities you've planned for them. They can then be active participants in exploring nature and making sense of their discoveries.

Encouraging peer-to peer talk...

... supports deeper learning. When students talk about their prior knowledge it allows them to think about what they already know related to a new topic and also provides an opportunity to learn from one another. Making connections between their own ideas and those of peers helps them create more meaningful conceptual frameworks. Research has found that giving students opportunities to discuss their ideas, as well as analyzing the arguments of others, helps them develop scientific knowledge.

... increases student participation. Partnering students to discuss ideas provides a way for everyone to participate. When students talk to each other they are more likely to share ideas freely, and the rotating structure enables them to talk with someone with whom they may not usually interact. As English Language Learners and more reticent students have a chance to hear what others have to say and share their ideas with just one peer, they may gain the confidence and language support to be able to contribute ideas in the larger group.

... establishes a culture of discussing ideas. When all student ideas are validated by the instructor and discussions center around finding the best ideas, students learn the importance of argumentation and discourse in science. If the instructor participates in the discussion alongside the students, showing equal curiosity and interest in the ideas being expressed, students will begin to believe the discussion is real, and their contributions are

TEACHING NOTES

valuable.

... is a productive use of time. This is a great routine to keep students engaged as you walk between locations. Engaging prompts allow students to practice explaining their ideas about the natural world. Students will typically want to talk to each other on a hike in any case, so why not offer a few questions or prompts that can direct their discussion to the theme of the day?

... fosters student-centered learning. When student ideas and input are at the heart of learning environments, students get the message that their thinking counts, and that they're capable of making sense of the natural world. Student-centered instruction takes into account the importance of the social context and empowers students to be responsible for their own learning as they co-construct understanding of scientific phenomena.

About Argumentation in Science. "In science, reasoning and argument are essential for identifying the strengths and weaknesses of a line of reasoning and for finding the best explanation for a natural phenomenon. Scientists must defend their explanations, formulate evidence based on a solid foundation of data, examine their own understanding in light of the evidence and comments offered by others, and collaborate with peers in searching for the best explanation for the phenomenon being investigated." – *Next Generation Science Standards*

Science Language:

Science is about coming up with the best explanation for all the available evidence. It's also about being open-minded about other explanations that could be better. In science, nothing is ever finally proven. That's why scientists tend to use language of uncertainty when discussing ideas and explanations. Try to use sentence starters such as: "Maybe..." "I wonder if..." "That evidence makes me think..." "The evidence seems to show..." and encourage students to phrase their statements using similar language.

Common Relevant Misconceptions

Misconception. If you let students share their ideas, they'll learn inaccurate information from each other, so instead of student discussion, instructors should just tell students the accurate information.

More accurate information. Constructivist educators recognize the importance of unearthing student ideas. At any given time, students have many ideas in their heads, some accurate, and some inaccurate (but often based on experience and logical thinking). Whether or not you provide opportunities to share these ideas out loud, students will have their own interpretations of the world, some of which might be inaccurate. Without opportunities to discuss their ideas, students may be able to memorize the more accurate ideas (and even pass tests), but they still privately maintain their original inaccurate beliefs unless they encounter convincing reasons to let them go. When students share ideas out loud, it draws attention to potentially conflicting ideas and inconsistencies. It also provides students with the opportunity to evaluate their ideas against other's thinking, and compare them with the available evidence. For instructors, student-centered discussion provides insights into student ideas, which can then be used to guide instruction. For example, it can help an instructor think of particular evidence that may benefit student thinking and help their ideas to evolve.

"I would teach how science works as much as I would teach what science knows. I would assert (given that essentially, everyone will learn to read) that science literacy is the most important kind of literacy they can take into the 21st century. I would undervalue grades based on knowing things and find ways to reward curiosity. In the end, it's the people who are curious who change the world."

— Neil deGrasse Tyson

Misconception. If you let students discuss ideas with each other, you'll lose control of the group, and they'll talk about off-task topics.

More accurate information. Students tend to talk to each other when hiking, and it's often about social topics unrelated to the theme of the hike. During *Walk & Talk*, we've observed that students mostly do stay on topic—as long

as the questions are interesting to them. We've also observed that students who participated in *Walk & Talk* tend to talk more about science ideas during unstructured time. As an instructor, it's impossible to listen in on every conversation between students, and in that sense, you can't control everything that's going on. Routines like *Walk & Talk* do give students more control and ownership of their own learning. This autonomy is more engaging for students and supports their development as learners. Researchers think that having a more equal structure for participation in a discussion (i.e., when the teacher gives up control to the students) promotes more active cognitive involvement, as students are less intimidated in freely expressing their ideas.

Misconception. Science is a collection of facts.

More accurate information. Because science classes sometimes revolve around dense textbooks, it's easy to think that's all there is to science: facts in a textbook. While field instructors don't have textbooks, they often end up sharing a lot of facts during field experiences. But facts are only part of the picture. Science is a body of knowledge that one can learn about in textbooks, and from facts, but it's also a process that must be learned through experiences. Science is an exciting and dynamic process for discovering how the world works. Learning to observe, ask questions, make explanations, and exchange ideas are critical components of the scientific process.

Misconception. The best way to learn is to be told lots of information.

More accurate information. We often assume that when we tell someone something, they'll learn it. At best, this tends to result in rote learning, often without comprehension, and can be easily forgotten over time. When students observe and ask questions, they're engaging their curiosity. When students are curious about something, they're more likely to keep learning. Investigating the natural world leads to deeper understanding. When instructors provide a quick answer or a set of facts, this tends to shut down the spirit of inquiry.

Misconception. Science is a solitary pursuit.

More accurate information. When scientists are portrayed in movies and television shows, they're often shown in silent laboratories, alone with their bubbling test-tubes. This can make science seem isolating. In fact, many scientists work in busy labs or field stations, surrounded by other scientists and students. Scientists often collaborate on studies with one another, mentor less experienced scientists, and just chat about their work over coffee. Even the rare scientist who works entirely alone depends on interactions with the rest of the scientific community to scrutinize his or her work and get ideas for new studies. Science is a social endeavor. This activity gives students a chance to voice their ideas, reflect on their learning, and engage in scientific discussions—just as scientists do.

Connections to the *Next Generation Science Standards (NGSS)*

Walk & Talk is a routine that can be used throughout instruction to support the kinds of three-dimensional learning experience called for by the NGSS. To experience three-dimensional learning, students need to engage in practices

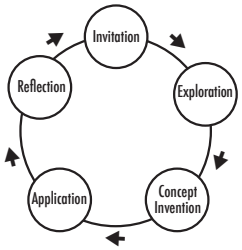
TEACHING NOTES

About the *Next Generation Science Standards (NGSS)* The development of the *Next Generation Science Standards* followed closely on the movement to adopt nationwide English language arts and mathematics *Common Core* standards. In the case of the science standards, the National Research Council (NRC) first wrote a *Framework for K--12 Science Education* that beautifully describes an updated and comprehensive vision for proficiency in science across our nation. The *Framework*—validated by science researchers, educators and cognitive scientists—was then the basis for the development of the *NGSS*. As our understanding of how children learn has grown dramatically since the last science standards were published, the *NGSS* has pushed the science education community further towards engaging students in the practices used by scientists and engineers, and using the "big ideas" of science to actively learn about the natural world. Research shows that teaching science as a process of inquiry and explanation helps students form a deeper understanding of science concepts and better recognize how science applies to everyday life. In order to emphasize these important aspects of science, the *NGSS* are organized into three dimensions of learning: Science and Engineering Practices, Crosscutting Concepts, and Disciplinary Core Ideas (DCIs). The DCIs are divided into four disciplines: Life Science (LS), Physical Science (PS), Earth and Space Science (ESS), and Engineering, Technology and Applied Science (ETS).

Read more about the *Next Generation Science Standards* at http://www.nextgenscience.org/ and http://ngss.nsta.org

TEACHING NOTES

Importance of teaching science practices. "Engaging in the practices of science helps students understand how scientific knowledge develops... It can also pique students' curiosity, capture their interest, and motivate their continued study..." – National Research Council *Framework for K-12 Science Education*. Focusing on these science practices will help to ensure a more scientifically literate public who will, hopefully, be better able to make thoughtful decisions.



This activity can be incorporated into any stage of the learning cycle.

to learn important science concepts (Disciplinary Core Ideas) and make connections to the big ideas in science (Crosscutting Concepts). In short, students should be using the tools of science to explore and investigate rich phenomena, trying to figure out how the natural world works.

This activity is not a three-dimensional learning experience in and of itself, but it can be used as a tool within an activity (and during a sequence of activities) to provide students with the opportunity to discuss their emerging ideas. Select specific *Walk & Talk* questions to give your students the opportunity to discuss ideas that will relate to and build upon the activities they're experiencing.

Walk & Talk can also help a group of students be more successful in learning, by creating a culture of discourse, in which all students are accustomed to sharing ideas and participating in discussions. This also supports the *Common Core State Standards for English Language Arts Literacy in History/Social Studies, Science, and Technical Subjects,* which state that students of all ages should be engaged in many discussions on a variety of topics relevant to understanding the concepts at their grade level. Participating in *Walk and Talk* throughout a program will give students the opportunity to engage in discussions with many different peers about a range of topics, and will lead them to be better prepared for contributing to discussions in other educational settings.

Activity Connections

Use *Walk and Talk* as an invitation at the beginning of a hike or any new activity, in the middle of an activity to keep students engaged in a discussion relevant to the activity, between activities, or as a reflection to give all students a chance to talk and discuss their ideas about a lesson or experience.

FIELD CARD

Cut out along outer lines, & fold along the centerline. This makes a handy reference card that will fit in your pocket.

Walk & Talk

Introduce the Activity

1. Form 2 equal lines with everyone on hike; include yourself & other adults in one of the lines.
2. Make sure everyone knows who their partner is (fist bump, high five etc.).
3. Introduce how it works: discussing questions & the gentle "touch of silence."

Discussing Questions

1. State question twice, then say, "walk & talk!"
2. After 1–3 min. use the "touch of silence" to get attention & stop the lines.
3. Everyone takes step back, & whole group shares interesting things their *partners* said (don't need to do this every time).
4. Your partner goes to other end of line & everyone in that line shifts one person down.
5. Repeat the process with a new question.
6. Seek out interesting questions/points made, & ask what others think, to get whole group discussion rolling.
7. Vary the way you handle each partner switch. It works well to vary the following after partners have talked:
   - a few share what their partner said, then switch partners
   - switch partners without whole group discussion
   - a few share their own thoughts. See if you can get an interesting whole group discussion going

Write more questions you plan to use here:

ABOUT BEETLES™

BEETLES™ (Better Environmental Education Teaching, Learning, and Expertise Sharing) is a program of The Lawrence Hall of Science at the University of California, Berkeley, that provides professional learning sessions, student activities, and supporting resources for outdoor science program leaders and their staff. The goal is to infuse outdoor science programs everywhere with research-based approaches and tools to science teaching and learning that help them continually improve their programs.

www.beetlesproject.org

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The following programs have contributed to the development of these materials by field testing and providing invaluable feedback to the development team. For a complete list of contributors and additional partners, please see our website at beetlesproject.org/about/partners/

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Photos: Pages 1 and 2 by Kevin Beals. *Icons*: Backpack by Rémy Médard; Growth by Arthur Shlain; Cut by Nathan Thomson; Outside by Petr Holusa; Park by Antar Walker; &Time by Wayne Middleton all from The Noun Project.

Funding from 2012-2015 for BEETLES publications such as this one has been generously provided by the S.D. Bechtel, Jr. Foundation, The Dean Witter Foundation, and the Mary A. Crocker Trust.

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